

REMARKS

Claims 1-34 are pending in the application. Claims 1-9, 11-25 and 27-34 stand rejected in the referenced office action. Claims 10 and 26 have been objected to. Claims 1 and 19 are independent claims. Reconsideration of the application as amended is respectfully requested. The Examiner's objections and rejections are addressed in substantially the same order as in the referenced office action.

OBJECTION TO THE TITLE

The Examiner has objected to the title as not being descriptive. The specifications have been amended to provide a substitute title that is believed to better describe the invention.

REJECTION UNDER 25 USC § 02

Claims 1-6, 8-9, 11-22, 24-25 and 27-34 stand rejected under 35 USC §102(e) as being anticipated by *Prammer* (US 20040008027). Claims 1 and 19 are independent claims.

The present invention is a method and apparatus for correcting for the effects of ringing produced by excitation and refocusing pulses in NMR data acquisition in earth formations. A Nuclear Magnetic Resonance tool conveyed in a borehole in the earth formation is used for pulsing the earth formation with a first pulse sequence having a first length, and with a plurality of additional pulse sequences having a length less than the first length. An estimate of the ringing is obtained from spin echo signals resulting from

the additional pulse sequences. This estimate is then used to correct spin echo signals resulting from the first pulse sequence. The corrected spin echo signals may then be processed to obtain a parameter of interest of the earth formation.

As the Examiner has noted, *Prammer* discloses many of the elements of claim 1. It is important to first note that the teachings of *Prammer* relate to two different concepts. One concept is that of estimation of a ringing signal. The second concept is that of determination of diffusion properties of fluids in the earth formation; this may be done using the correction method of the first concept. With this in mind, we note that the Examiner has referred to paragraph [0046] of *Prammer* as disclosing element (b) of claim 1, "exciting said earth formation with a plurality of additional pulse sequences having a second recovery time less than said first recovery time."

Further review of the application shows that the details of what is in paragraph [0046] are discussed with reference to Fig. 27. This generally includes paragraphs [0140] – [0145] and has no discussion of estimation of a ringing signal (which is done starting at paragraph [0149] and is discussed below). It should further be noted that with the interleaving, what is done is a first pulse sequence at a first frequency and a second pulse sequence at a different frequency. Element (b) of claim 1 specifies a "plurality" of additional pulse sequences. Admitting for the sake of argument only that what is disclosed in paragraph [0046] satisfies element (b) of claim 1, then it is clear that the particular sequence of interleaved pulses of Fig. 27 is incapable of element (c) of claim 1.

In addition, the interleaved pulse sequences at two different frequencies are **not** used to determine a ringing signal.

Applicant would like to draw the attention of the Examiner to the actual methodology used by *Prammer* for obtaining a ringing signal estimate.

One method is generally described in paragraphs [0153] – [0173]. What is described therein is a straightforward combination of PAP sequences on an echo-by-echo basis. This is done using CPMG sequences of the same length and same recovery time, and hence does not satisfy element (b) of claim 1.

A second method for ringing estimation is described in paragraphs [0174] – [0179]. The ringing is determined using a special REPS sequence that does not have the 90° tipping pulse. There is no mention in this section of recovery times, hence element (b) of claim 1 is not satisfied.

In order to sustain a rejection under 35 USC § 102, a single prior art reference must disclose each and every limitation of the claimed invention arranged as in the claim. This is clearly lacking in the present case for reasons discussed above. Accordingly, applicant respectfully submits that claim 1 and claims 2 - 18 that depend upon claim 1 are patentable under 35 USC §102 over *Prammer*.

Applicant further notes that with respect to claim 3, the additional limitations therein are not disclosed in *Prammer* as part of the method of estimating a ringing signal amplitude. The first and second method for ringing estimation in paragraphs [0153] – [0179] make no mention that the second recovery time corresponds to partial recovery of nuclear spins.

Applicant further notes that with respect to claim 4, the additional limitations therein are not disclosed in *Prammer* as part of the method of estimating a ringing signal amplitude. The first method for ringing estimation in paragraphs [0153] – [0173] use conventional CPMG sequences while the second method for ringing estimation in paragraphs [0174]-[0179] uses sequence in which there is no 90° pulse (see 0177). A CBW sequence does not read on either of these two.

Applicant further submits that claims 1-18 are also patentable under 35 USC §103 over *Prammer* and the prior art of record. In order for a claimed invention to be unpatentable under 35 USC §103, all the limitations of the invention must be disclosed in the references when combined and there must be a suggestion in the references or a motivation to combine them. The first conditions is not met here with respect to the substantive limitations of claim 1 discussed above.

Claim 19 includes the substantive limitations of claim 1 discussed above. Accordingly, Applicant respectfully submits that claim 19 and claims 20 – 32 that depend

upon claim 19 are also patentable under 35 USC §§103 over *Prammer* and the prior art of record.

REJECTIONS UNDER 35 USC §103

Claims 7 and 23 stand rejected under 35 USC§103 over *Prammer* in view of *Edwards* (US6452389). Applicant notes that here is no teaching or suggestion in *Edwards* of the substantive limitations of claim 1 discussed above. Accordingly, claims 7 and 23 are patentable under 35 USC § 103 over *Prammer* in view of *Edwards*.

The Commissioner is hereby authorized to charge any additional fees or credit any overpayment to Deposit Account No. 02-0429 (584-36526-US).

Respectfully submitted,

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